A decode tuner module 64 analyzes the header section 6a of the transformed linear matrix image 6 to determine image-distortion characteristics 32 of the transforming image data channel 40. As discussed heretofore with regard to the image data channel 40, the image-distortion characteristics 32 may include dimensional (X and/or Y) scaling, color mapping, downsampling, clipping, pagination, margination, smoothing, compression, and printer control language encapsulation. The determination of the image-distortion characteristics 32 will be discussed subsequently in further detail.

An encoding parameter reconstructor module 66 decodes a portion of the header section 6a according to the image-distortion characteristics 32 so as to recover the encoding parameters 30 that were used to encode the binary data 2 into the encoded data section 4b, and which can now be used to decode the received transformed data section 6b. The recovery of the encoding parameters 30 will be discussed subsequently in further detail.

A data decoder module 68 decodes the received transformed data section 6b according to the encoding parameters 30 so as to recover the binary data. In some cases, the binary data may be encrypted, in which case the data decoder 68 forms binary data that is decrypted by a decryptor module 70 to form the recovered binary data 8. In other cases, the binary data is not encrypted, and so the data decoder 68 forms the recovered binary data 8 directly. The decoding operation will be discussed subsequently in further detail.

A data consumer 72 utilizes the recovered binary data 8. One preferred utilization of the recovered binary data 8 is as a firmware upgrade for the printer 130. In this case, the data consumer 72 installs the firmware upgrade in the printer 130. Another preferred utilization of the recovered binary data 8 is as an advertisement or a discount coupon. In this case, the data consumer 72 stores the advertisement or coupon, and tracks the usage and/or operating conditions of the printer 130 so as to determine when to print the advertisement or coupon.

Considering now in further detail an alternate embodiment of the server 110 and host 120, and with reference to FIGS. 6 and 7 respectively, a server 110b is coupled to a host 120b. In the alternate embodiment, the linear matrix encoder subsystem 20 resides in the host 120 rather than in the server 110, and is preferably implemented as a set of browser-executable instructions in a language such as Java, Javascript, or the like. Consequently, the server 110b provides the encrypted data and key 24 to the host 120b (note that if the server 110b does not include optional data encryptor 22, then the binary data 2 is provided to the host 120b instead of the encrypted data and key 24). The host 120b then forms the encoded linear matrix image 4 from the data. Other modules and data of server 110b and host 120b generally are similar to those of server 110a and host 120a. Host 120b is coupled to, and sends encapsulated transformed matrix image 48 to, printer 130.

In the preferred embodiment, modules 22,26,28,34,42,46,62,63,64,66,68,70,72 are implemented as computer-executable software or firmware instructions that execute

corresponding portions of the flowcharts of FIGS. 10 through 13 that will be discussed subsequently. These steps are partitioned as appropriate among computer-readable media such as memories 114,124,132. Each memory 114,124,132 may be an electronic, magnetic, optical, or other physical device or means that can contain or store a computer program for use by, or in connection with, a computer-related system or method. A non-exhaustive list of more specific examples of the computer-readable media includes an electrical connection (electronic) having one or more wires, a portable computer diskette (magnetic), a random access memory (RAM) (electronic), a read-only memory (ROM) (electronic), an erasable programmable read-only memory (EPROM, EEPROM, or Flash memory) (electronic), an optical fiber (optical), and a portable compact disc read-only memory (CD-ROM) (optical). Note that the computer-readable medium could even be paper or another suitable medium upon which the program is printed, as the program can be electronically captured, via for example optical scanning of the paper or other medium, and then compiled, interpreted, or otherwise processed in a suitable manner if necessary, and then stored in a computer memory.

In other embodiments, modules 22,26,28,34,42,46,62,63,64,66,68,70,72 may be implemented in hardware with any one or a combination of the following technologies, each of which are well known in the art: a discrete logic circuit(s) having logic gates for implementing logic functions upon data signals, an application-specific integrated circuit (ASIC) having appropriate combinatorial logic gates, a programmable gate array(s) (PGA), a field programmable gate array (FPGA), and the like.